and the Northampton Institute has done well to adopt such a means of encouraging earnest work. The Lord Mayor and Sheriffs have consented to pay a State visit to the Institute on March 18, for the purpose of inspecting it and declaring it formally open. The buildings and equipment have up to the present cost over 80,000*l.*, and the expenditure upon the latter is not yet complete. In addition the land—over one and a quarter acres—generously given by the late Marquis of Northampton, is estimated to be worth not less than 25,000*l.* The Institute is a branch of the City Polytechnic, and is situated in one of the busiest parts of the metropolis immediately north of the City boundary.

FROM the sixth annual report of the Technical Instruction Committee of the City of Liverpool, we gather the following items:—The Committee clearly recognises that technical education is inseparably bound up with general secondary and higher education, and must be organised in vital connection therewith.—After some delay, a commencement has been made with the erection of the new Central Technical Schools. The cost of the erection of the building comprising the new schools and the museum extension will be nearly 90,000*l.*—The Committee remark that it would be more satisfactory if greater attention were paid to mensuration and other practical applications of elementary mathematics; since it is a frequent complaint, on the part of teachers of special technical classes, that their students come to them with too little mathematical knowledge and aptitude, and are often unable to grapple with even simple quantitative problems. This difficulty not only applies to Liverpool, but to technical classes in most parts of the country.—The co-operation of the University College with the educational work of the Committee is most satisfactory, and is of great assistance in the construction of an organised scheme of technical instruction.

THE London University Commission Bill was read a second time in the House of Lords on Friday last. In moving the second reading, the Duke of Devonshire pointed out that the measure was founded on the recommendations of the Royal Commission which reported in favour of the two functions of teaching and examining being combined in one University for London. The Bill is substantially the same as that which passed the House of Lords in the last Session of Parliament, but reached the House of Commons too late to be carried through all its stages. To provide against the occurrence of a similar difficulty, the Bill has been introduced earlier in the year than has hitherto been found possible; which gives grounds for the hope that it will take its place on the Statute-book before the close of the present Session. A very large part of the formidable opposition against the Bill has been removed by the introduction of certain modifications. These amendments are in the direction of restricting the power of any future Senate to alter the statutes or regulations made by the Statutory Commission in accordance with the provisions contained in the schedule of the present measure. "I cannot even now assert that opposition no longer exists," said the Duke of Devonshire, "but it is very difficult indeed to understand upon what grounds the measure can be opposed. I have endeavoured to show by what an overwhelming amount of scientific teaching, opinion, and experience it is supported, and I am utterly unable to discover any weight of opinion on the other side which can for a moment enter into competition with the expressions in its favour." Lord Herschell and Lord Reay warmly supported the Bill, which was then read a second time

AT the recent meeting of the Federated Institution of Mining Engineers, Prof. Henry Louis, Durham College of Science, Newcastle, read a paper on "Technical Education in Mining," which should be seen by all Technical Education Committees having mining classes. Prof. Louis made, at the outset, a broad distinction between the training suitable to the working miner or subordinate mine official, and that suitable to mining engineer or general manager. As regards the former he ought to leave his Board school in about the fifth standard, and commence receiving his technical instruction—a very different thing from technical education—underground, whilst continuing his scientific education in evening continuation and science schools. It is greatly to the discredit of the powerful and wealthy miners' unions of this country, that they make no attempt to provide the rising generation with scientific training bearing on their work, especially seeing that such training is the best possible safeguard against accident. For both working miners and engineers, the present legislation, that takes no account of time spent in learning the sciences underlying the art of mining, is most pernicious. Mining students ought to enter some mining college at the age of seventeen, and devote at least three years to learning first the pure and then the applied sciences that they will require in their profession, but none of the pure sciences need to be studied very profoundly. The systematic neglect of the study of dressing of minerals in this country has already had serious commercial results, *e.g.* at Nenthead, and its cultivation is urged. Prof. Louis suggests the introduction of the American system of "Summer Mining Schools" as a method worthy of trial for giving college students an insight into practical work, but points out that college work alone without practical experience is insufficient. On the very open question as to whether college work should precede or follow practical training, Prof. Louis holds the former to be probably the better plan. He concludes with the following recommendations. (1) Every manager of a mine, whether coal or metalliferous, to hold a certificate. (2) Examinations for certificates to be controlled by a central Board, and made uniform in conditions and character for the whole of Great Britain (and if possible for the Colonies also) (3) Residence in a recognised science college to count as part of term of apprenticeship, whilst not less than three years underground should also be insisted on. (4) Every mine surveyor to hold a certificate of proficiency.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 27.—"Mathematical Contributions to the Theory of Evolution. On the Law of Ancestral Heredity." By Karl Pearson, F.R.S., University College, London.

The Darwinian theory has for its main factor the perpetuation of favourable variations by natural selection under the law of heredity. Hence any complete quantitative treatment of evolution must deal (1) with the nature and distribution of variation; (2) with the nature and influence of selection, and this not only upon the selected but upon all correlated characters or organs; and (3) with the law of heredity. Earlier published and other written but unpublished papers of the present writer cover to some extent the ground of (1) and (2). Although the mathematical theory of variation and selection is yet very far from completion, the general lines on which it will proceed seem fairly clear. With the law of heredity, however, the case has hitherto been different. Much has been written on the subject, much has been attributed to inheritance, but the quantitative measurements and facts have formed such a small and slender proportion of the whole, that it has been extremely difficult to base a rounded mathematical theory on what is really known.

The very suggestive theory of heredity developed in Mr. Galton's "Natural Inheritance" has two main features: (*a*) a theory of regression, which states the average proportion of any character which will be inherited under any degree of relationship. This theory is very simple: if the average of the sons of any parent has w of the parent's deviation from the average parent, then the average grandson would have w^2 of the deviation, and so on. Collateral heredity is also determined, and for two brothers was found equal to $2w$. Mr. Galton's value of w was $\frac{1}{3}$.

(*b*) A law of ancestral heredity. According to this law the two parents contribute $\frac{1}{4}$, the four grandparents $\frac{1}{8}$, the eight great grandparents $\frac{1}{16}$, and so on, of the total heritage of the average offspring.

These two parts of the theory, however, are not in entire agreement.

The recent publication of Mr. Galton's remarkable paper on ancestral heredity in Bassett hounds has, however, led the writer to reconsider (*b*). If that law be true, then for every organ and for every grade of kinship the amount of heredity is numerically determinable. The solution of the problem of heredity is thrown back upon the solution of an infinite series of linear equations. Their solution gives results which seem to the writer in good agreement with all we at present know about the influence of heredity in various degrees of kinship. For example, fraternal is no longer *twice* filial regression, but has a value (0·4000) well in accordance with calculations of English stature and Indian cephalic index. In short, if we discard Mr. Galton's relations between the regressions for various grades of kinship, and start solely from his law of ancestral heredity, the whole theory of heredity becomes simple, luminous, and well in accordance with such quantitative measurements as have so far been made.

It is possible to somewhat generalise the law of ancestral heredity. Modifying Mr. Galton's definition of midparent, a conception is formed of the mid-sth parent, a sort of mean of the ancestry in the sth generation, and the contribution of this mid-sth parent to the offspring is assumed to have a constant ratio to that of the mid-$(s + 1)$th parent, whatever be the value of s. With this simple law the whole of heredity is found to depend upon a single constant γ, termed the *coefficient of heredity*. γ may vary from organ to organ and from race to race. It may itself be subject to selection, if heredity be not looked upon as *à priori* given and antecedent to any evolution by natural selection. In Mr. Galton's statement of the law, $\gamma = 1$. This may really be the case, but it is not necessary to the theory, and it is not required by any facts as yet observed.

Given this simple law of ancestral heredity, there flow from it the following results:—

(1) Heredity between any grade of individual kinship.

(2) The value of the stability that results from any long or short process of selective breeding, and the variability of the breed so established.

(3) The law of cross heredity, *i.e.* the degree of relationship between two *different* organs in kindred.

(4) That panmixia without active reversal of natural selection does not lead to degeneration.

It may be of interest to add that since the law of ancestral heredity allows for the variability of each individual ancestor from the ancestral type, giving that variability its share in the heritage of the offspring, it is inconsistent with Weismann's theory of the germplasma. It does not, of course, answer one way or the other the question as to the inheritance of acquired characters.

Thus Galton's law of ancestral heredity leads to, what has not hitherto existed, a rounded and comprehensive theory of heredity. It describes with surprising closeness all facts so far quantitatively determined, and opens up a wide range of conclusions which await testing by fresh data. Should those data be in agreement with its predictions, then the law of ancestral heredity will in the future play as large a part in the theory of evolution as the law of gravitation has played in planetary theory. It is the quantitative basis on which Darwinism, the evolution of species by natural selection *combined with heredity*, will then be placed; and at one stroke it will clear away a veritable jungle of semi-metaphysical speculations and hypotheses, and this for the simple reason that it is based upon quantitative observations and not on verbal subtleties. It will be difficult, perhaps, to make people realise that there is a science of heredity, simple and consistent, in existence; yet even at the present time it is the number of observers and experimenters, rather than the science, which needs to be strengthened.

"The Magnetic Properties of almost pure Iron." By Ernest Wilson.

In the Siemens Laboratory, King's College, London, a series of experiments were carried out on a ring of iron containing only about ·12 per cent. impurities. The ring was tested as received and after careful annealing. As received, the magnetic hysteresis loss was slightly greater than in an exceptionally good sample of transformer plate examined by Ewing. After annealing the hysteresis loss was still slightly inferior to the Ewing specimen, but an exceptionally large value was obtained for its maximum permeability; μ being 5490 for $B = 9000$ C.G.S. units per square centimetre. The coercive force for maximum $B = 15{,}720$ is 1·13 C.G.S. units. Further experiments were carried out to investigate the apparent magnetic instability of the specimen. The author finds that this effect cannot be accounted for by the self-induction of the ring, nor the time taken for the current to rise to its full value. A method is explained for testing the rapidity with which the current rises to its maximum value. The propagation of magnetism in the ring as affected by induced currents is dealt with, and it is pointed out that these may have an effect on the observations, although it is difficult to account for such times as five and ten seconds, unless the molecule itself be considered. It is deduced from the experiments that the amplitude of induction might not be so great for high frequency and small induction density, which would be of importance in the case of transformer cores if it existed. Reference is made to experiments with alternate currents which show no such diminution; but it is pointed out that experiments with alternate currents would be difficult to carry out, on account of the necessary accurate control of the magnetising force.

"The Kelvin Quadrant Electrometer as a Wattmeter and Voltmeter." By Ernest Wilson.

Two of these instruments were available to the author when carrying out the series of tests described in this paper. He was thus able to use one in connection with a revolving contact-maker to determine the instantaneous rate at which work was being done by alternate currents while testing the other as a direct-reading wattmeter. The author finds that by the contact-maker method he gets good accuracy by taking ten positions of the contact-maker per half-period, and calculating directly from the figures without integrating the curves. When current and potential were in phase an agreement within 1 or 2 per cent. was obtained between the watts calculated this way and the product of the square root of mean square values given by an ammeter and voltmeter. The use of a small mallet for gently tapping the electrometer base is recommended to overcome the effects of viscosity of the acid in the electrometer when this is old, although in the new form of instrument the viscosity gives little or no trouble, since the sensibility is not so great. The wattmeter constant was determined for various frequencies, phase differences, amplitudes, wave forms, and the results show that the Kelvin quadrant electrometer can be used with accuracy as an alternate current wattmetter, but that it is necessary to make sure that within the range of potentials applied Maxwell's formula is verified. Two methods of doing this are explained. The author observed a potential of nearly half a volt, due to the revolving contact-maker alone, when directly placed across the electrometer; but this inductive effect disappeared when a capacity, large compared to that of the instrument, was placed across it. The paper concludes with an interesting note on a manganin strip used for comparatively large currents. The experiments were carried out in the Siemens Laboratory, King's College, London.

February 3.—"The Pharmacology of Aconitine, Diacetylaconitine, Benzaconine and Aconine, considered in relation to their Chemical Constitution." By J. Theodore Cash, M.D., F.R.S., and Wyndham R. Dunstan, M.A., F.R.S.

In this research the pure alkaloids aconitine, benzaconine and aconine derived from *A. Napellus*, and an aconitine derivative, diacetylaconitine were examined with reference to their action upon warm- and cold-blooded animals, a similar series of experiments being made with each alkaloid for purposes of contrast.

It was found if the dose of aconitine, which is invariably lethal per kilo. body weight, be represented by the unit, that (in very general terms) diacetylaconitine would have $\frac{1}{40}$" of the toxicity of aconitine, benzaconine $\frac{1}{300}$, and aconine $\frac{1}{3000}$. There is, therefore, an enormous variation in toxicity amongst these alkaloids.

A few of the chief results obtained are here summarised.

Aconitine in small doses slows the pulse, whilst larger proportions not only accelerate but disturb the sequence of ventricles upon auricles—an independent rhythm being produced at one stage of action. The central vaso-motor apparatus is much more powerfully affected than the peripheral, great respiratory acceleration precedes slowing, which, according to the dose, may pass into failure. Sensory nerves are depressed in function, whilst motor-nerve terminations and skeletal muscle retain their activity, except when largely hyperlethal doses have been used.

Diacetylaconitine has less tendency to cause disturbance of sequence between auricles and ventricles; but, apart from variations in this and other minor points, its action is in the main like that of aconitine.

Benzaconine alters the cardiac rhythm, the pulse becoming much slowed; and at one phase of action the sequence of ventricle fails to every second auricular beat. Entire suspension of contraction may even occur, both auricles and ventricles, followed by spontaneous resumption of systole. Respiration is slowed from the first.

Sensory nerves are but little affected, whilst motor-nerve endings and, to a lesser degree, skeletal muscle show a reduced and curiously intermittent response to stimulation.

Aconine strengthens the cardiac systole, and is opposed to the dislocation of rhythm produced by aconitine, to which it therefore acts in a large measure as an antagonist and antidote. On motor-nerve termination it has a curare-like effect.

All the alkaloids examined reduce body temperature, though in varying degree.

In conclusion it is pointed out that, whilst the toxicity of aconitine mainly depends on the presence of the acetyl group, the introduction of two additional acetyl groups into the aconitine molecule does not materially alter the pharmacological action, but merely reduces the toxicity of the parent alkaloid. The *removal* of the acetyl group abolishes the stimulant action upon the respiratory centre and pulmonary vagus. It also favours reduced activity in motor, rather than in sensory nerve endings.

The benzoyl group—present in benzaconine, absent in aconine—causes a peculiar and distinct modification in the heart's action, associated with a disturbance of sequence never witnessed after aconine. The curare-like effect of aconine, and the intermittent failure of the stimulated benzaconine muscle, are also traceable to the modification in chemical constitution arising from the absence or presence of the benzoyl group.

Attention is drawn to the practical bearing of the fact that benzaconine and aconine, pharmacological antagonists of aconitine, occur with it in the root of *Aconitinum Napellus*, from which the medicinal preparations of the drug are made.

February 10.—"Contributions to the Theory of Alternating Currents." By W. G. Rhodes, M.Sc. (Vict.).

This paper was divided into two parts. Part I. dealt with a method of finding the steady values of alternating currents in any circuits or systems of circuits, without having to perform integrations of differential equations which may be somewhat complicated.

Part II. was devoted to the consideration of the effects of higher harmonics in E.M.F.s and currents on the values of the impedances and reactances of circuits.

Among other results it was shown that periodic E.M.F.s and corresponding currents can in all cases be represented by simple sine curves having the same root mean square values, and suitable phase positions depending on the time constants of the circuits and on the periodicities of the harmonics present.

February 17.—"On Artificial Temporary Colour-Blindness, with an Examination of the Colour-Sensations of 109 Persons." By George J. Burch, M.A.

By exposing the eye to bright sunlight in the focus of a burning-glass behind a red screen, a condition of temporary red-blindness is induced during which scarlet geraniums appear black and roses blue. Green-blindness and also violet-blindness may be produced by similar means.

The author has systematically investigated the appearance of the spectrum during the colour-blindness induced by exposure to intense light from various parts of the spectrum, and finds that the red from A to B, the green near E, the blue half-way between F and G, and the violet at and beyond H, produce well-defined and characteristic results, indicating that each of these colours corresponds to a definite colour-sensation.

In each case all direct sensation of the colour used for fatiguing the eye is lost, but the observer is conscious of a positive after-effect of the same colour, by which the hue of all other colours is modified. The temporary abolition of any one colour-sensation is without effect on the intensity of the remaining colour sensations. Any two, or any three, of the four colour sensations, red, green, blue, and violet, can be simultaneously or successively exhausted. The observed facts are, in the author's opinion, more in accordance with the Young-Helmholtz theory than with that of Hering, but they imply the existence of a fourth colour-sensation, namely blue.

Physical Society, Feb. 26.—Mr. Shelford Bidwell in the chair.—The meeting was held at Eton College. The President informed the Society of the resignation of one of its Hon. Secretaries: Mr. T. H. Blakesley, M.A. In doing so, he referred to the many important services rendered to the Society by Mr. Blakesley, and he expressed the Society's deep and general regret that Mr. Blakesley should now feel unable to continue them. The Council elected Mr. W. Watson to the office of Hon. Secretary.—Prof. T. C. Porter, in whose laboratory the meeting was held, said it gave him very great pleasure to welcome the Physical Society. Eton had been most properly called "the English home of ancient classical learning." For the education of youth, classics had proved themselves of cardinal value. He believed that other Fellows of the Physical Society, with himself, desired that this revered tradition of classics should be maintained at Eton; at the same time, they would agree with him that there was no better supplement to classics than a fair knowledge of the natural sciences. Prof. Porter then gave a lecture, illustrated by lantern photographs, on "Observations on the Peak of Tenerife." He also described his method for measuring the diameter of the earth. The method consists in observing the shadow cast by the Peak upon the sea, and measuring the time that elapses between the moment when the apex of the shadow touches the sea-horizon, and the instant when it is eclipsed by the shadow of night. Prof. Porter called attention to a phenomenon hitherto unnoticed, *i.e.* that the heated air ascending from the Peak casts a shadow, seen as a faint prolongation of that of the Peak; it rises obliquely from its apex. A photograph was exhibited, taken on a quarter-plate, in which is visible the curvature of the horizon as viewed from the altitude of the Peak. An interesting series of unique photographs, illustrating the conformation of the Peak and the phenomena of sunrise and twilight in that latitude, was also shown. In regard to twilight he noticed that the first approach of night, as observed looking eastward, is marked by a dark border of about five degrees width, followed by a sky somewhat lighter. The lecturer discussed also a new theory of geyser action. The theories of Bunsen and others fail to explain why the geyser-throat appears almost completely full at the end of an eruption. This immediate refilling is the more remarkable when it is remembered that some geysers of the Yellowstone region discharge a million and a half gallons at each eruption, and that the eruptions may occur at five-minute intervals. Moreover, the theories generally accepted assume steeper temperature-gradients than those in a region like Yellowstone. Prof. Porter suggests that the phenomena are better explained on the assumption of an arrangement of strata such as exists in artesian-well districts, the throat or shaft of the geyser being in the position of a well communicating with a subterranean stream—the "tube" of the geyser. From the disturbed nature of the region the tube of the geyser follows a waved course; the "shaft" rises from the crest of the terminal wave; the other crests may be steam-traps. Since a basin-like formation is characteristic of all geyser regions, it is fair to assume that the end of the tube remote from the shaft has an outcrop in the hills that form the sides of the basin. By means of this outcrop, water continually flows into the tube. When the tube does not sink deeply enough to attain the temperature necessary for the generation of steam, a quietly-flowing hot-spring is the result. But if, at any point, the tube descends to underground temperatures sufficiently great, steam is formed, and is trapped at the highest point of a bend. Ultimately this steam checks the flow of water, until the accumulated head of cool water from the hills overcomes the resistance, condenses the steam, and re-establishes liquid continuity. Urged by the pressure behind it, the stream is impelled towards the geyser throat; it forces the hot water before it until equilibrium is once again restored in the tube. Prof. Porter afterwards exhibited a method for viewing lantern projections in stereoscopic relief. A slotted disc rotates in front of two lanterns. These project two stereoscopic views in rapid alternation upon a screen, in such a way that the two projections are approximately superposed. In the rim of the disc, other slots are cut, through which the observer looks. The arrangement of slots is such that the right or left eye is only able to see the screen at the moment when its own picture (*i.e.* the picture from the right or left lantern) is on the screen. When the rotation is sufficiently rapid, the views appear as one, without "flicker," in stereoscopic relief.—The President proposed votes of thanks, and the meeting was adjourned until March 11.

Entomological Society, February 16.—Mr. G. H. Verrall, Vice-President, in the chair.—Mr. G. C. Champion exhibited specimens of *Isodermus gayi*, Spin., from the Straits of Magellan, and *I. planus*, Er., from Tasmania, both found by Mr. J. J. Walker. The genus, *Isoderma*, belonging to the Aradidæ, afforded an interesting case of geographical distribution, the only known species occurring in Chili, Australia and Tasmania. —Mr. C. O. Waterhouse referred to the similar distribution of other species of insects, which went to support the theory of a former connection between South America and Australia.—Mr. Champion also showed an example of *Bagous lutosus*, Gyll., from Sweden. This insect had been on the British list since the time of Stephens, but possibly in error, as all the examples he had seen in collections were wrongly so named.—Mr. Jacoby exhibited a pair of the singular weevil, *Apoderus tenuissimus*, Pasc., from the Philippines.—Mr. Burr exhibited species of Orthoptera, of the family Eumastacidæ, resembling dead leaves. This was the only family of Acrydiidæ in which such resemblances were found.—Dr. Chapman exhibited a specimen of *Zygæna exulans* with six wings, the supernumerary pair arising between the normal left forewing, and the corresponding leg on the same side. The uppermost wing appeared normal in every respect, the second was a reduced copy of the basal half of a forewing, and the third a portion of crumpled wing-structure.—Mr. O. E. Janson exhibited a pale variety of the rare *Papilio mikado* taken in South Japan.—Mr. Tutt showed a variety of *Enodia hyperanthus*, taken by Mr. F. H. Day near Carlisle, and banded on the underside like a *Cœnonympha*; also two moths from the same neighbourhood, which, after careful comparison, he regarded as females of *Hydrilla palustris*. This sex was almost, or quite, undiscovered in Great Britain, and the occurrence of the species so far from the fen-district was remarkable.—Mr. H. J. Elwes read a paper, entitled "A Further Revision of the Genus *Erebia*," which was illustrated by the exhibition of examples of every known species. Tracing the geographical distribution, he stated that the principal European centres of the genus were the Pyrenees, and especially the Alps, only a few forms occurring in Scandinavia, while the Ural Mountains and Caucasus were almost destitute of species. The genus became abundant in East Siberia, from which region the few North American forms appeared to have been derived.—Dr. Chapman also read a paper on the species of the genus *Erebia*, a revision based on the male appendages, illustrated with drawings of these organs in about sixty species.—In connection with the above papers Mr. Tutt exhibited and made remarks on long series of *Erebia nerine*, *E. glacialis*, *E. euryale*, *E. ligea*, &c., chiefly from the Alps.

Paris.

Academy of Sciences, February 28.—M. Wolf in the chair.—Chemical action of the silent discharge: oxides of carbon and nitrogen, by M. Berthelot. A continuation of a previous paper. Mixtures of carbon monoxide and nitrogen, submitted to the prolonged action of the silent discharge, give only the sub-oxide C_4O_3, the nitrogen being unchanged. With excess of hydrogen, a condensation product of the empirical formula $(CH_2O)_n$ is produced. For carbon dioxide, six hours' action with hydrogen in excess caused the almost complete absorption of the oxide. With nitrogen in addition an amido-compound and some ammonium nitrite were formed.—Chemical action of the silent discharge: alcohols and etherial derivatives in presence of nitrogen, by M. Berthelot. The systems studied were mixtures of nitrogen with methyl alcohol, ethyl alcohol, normal propyl, isopropyl and allyl alcohols, phenol, pyrocatechol, resorcinol, hydroquinone, pyrogallol, glycol, and methyl and ethyl ethers.—Fuchsian functions and the equation $\Delta u = e^u$, by M. H. Poincaré.—On a particular case of the motion of liquids, by M. E. Fontaneau.—On the Euler transformation and the determination of singular points of a definite function by Taylor's development, by M. Ernst Lindelöf.—On an extension of Gauss's method of quadrature, by M. Henry Bourget.—On autocollimating telescopes, and an optical verifier of the lines and surfaces of machines, by M. Ch. Dévé. The arrangement described, which is illustrated by three diagrams, permits of the exact verification of the accuracy of plane surfaces, or of the parallelism of two surfaces.—Lines of force and equipotential surfaces in nature, by M. G. M. Stanoiévitch. The paper is illustrated by three plates showing the analogy between the lines of growth in plants and equipotential surfaces. The nodes in the wood play the part and produce the same disturbances in the cellular field as magnetic or electric poles in their respective fields.—On the properties and crystallisation of anhydrous barium sulphide, by M. A. Mourlot. The crystallised sulphide was obtained in two ways: by submitting amorphous barium sulphide, previously prepared by the action of hydrogen sulphide upon barium carbonate at a red heat, to the temperature of the electric furnace, and by heating directly in the electric furnace a mixture of barium sulphate and carbon in the exact proportions necessary to form the sulphide. In this way white crystals belonging to the cubic system were obtained, which behave toward chemical reagents like the amorphous form, except that the action is somewhat slower in the case of the crystals. The behaviour of the sulphide towards fluorine, oxygen, and oxidising agents, phosphorus oxychloride, and carbon was studied.—Action of carbon monoxide upon palladious chloride, by M. E. Finck. By the interaction of these two substances three compounds can be isolated, $COPdCl_2$, $C_2O_2PdCl_2$ and $C_3O_3Pd_2Cl_4$, corresponding to the analogous platinum compounds.—On hydrocinnamide, by M. Marcel Delépine. The crystallised hydrocinnamide has the composition $2C_{27}.H_{24}.N_2.H_2O$, and possesses the properties of the glyoxalidines. It is a base forming stable salts, and the name cinnamine is proposed as more suitable than hydrocinnamide.—On an oxyptomaine, by M. Œschner de Coninck. The pyridic ptomaine described in an earlier paper, and which possesses the composition of a collidine, is easily oxidised by hydrogen peroxide to an oxycollidine,

$$C_8H_{10}(OH).N,$$

from which the original base can be regenerated by distillation with zinc-dust.—On the oxidation of sorbite to sorbose, by M. Gabriel Bertrand. An examination of the experiments of M. Matrot upon the same subject, according to which sorbose is produced whatever ferment be employed in the oxidation. This result is controverted in the present paper, the method of oxidation used by M. Matrot, in which the cultures are exposed to contamination by air organisms, being the cause of the effects observed.—On the preparation of white wines from red grapes, by M. V. Martinand. The fermentation is interrupted by cooling, and the colour removed by aëration of the liquid. After filtration from the solid deposit, the fermentation is completed.—On the influences of intermittent rest and work upon the mean power of a muscle, by MM. André Broca and Charles Richet. When the load on the muscle is below a certain limit, intermittent repose is harmful; for moderate loads, without any effect; and with still greater weights, favourable to the production of work.—Evolution and structure of the conjunctive elements in *Paludina*, by M. Joannes Chatin.—The dissociation of the egg in a large number of distinct individuals, and the cycle of evolution in *Encyrtus fuscicollis*, by M. Paul Marchal.—On optical anomalies and polymorphism, by M. Fréd. Wallerant.—Contribution to the geology of Lower Sénégal, by M. Stanislas Meunier.

Amsterdam.

Royal Academy of Sciences, January 29.—Prof. van de Sande Bakhuyzen in the chair.—Prof. Jan de Vries, on some groups of circles. Construction of a system of *n* lines, forming (n_3) triangles, whose circumscribed circles pass through the same point. Inversion of a quadrilateral and its four circles into a spherical configuration of eight points and eight circles. The analogous spherical configuration 16_5 in connection with Miquel's theorem on the pentagon.—Prof. Martin exhibited a new crystalline form of gold, a perfect tetrahedron, found in Brazil. On the ground of the existence of this crystal the speaker considered hemihedrism of gold possible, though not proved by this single specimen.—Prof. Kluyver presented a paper, entitled "On the binominal development," dealing with the Rev. Simmons's New Theorem in Probability (*Proceedings* of the London Mathematical Society, 1895, p. 290). A method of investigation entirely different from that used by the Rev. Simmons enabled the author to confirm the results arrived at by the latter, concerning the "complete sets" of trials. As for the "broken sets," the same method led to a first approximation of the "advantage," from which it was possible to derive the conditions that must be satisfied, if the probability of net gain is to exceed the probability of net loss.—Prof. Jan de Vries presented, on behalf of Dr. G. de Vries, of Haarlem, a paper entitled "Le tourbillon cyclonal." By this the author means a vortex, which is at the same time both a ring vortex and a columnar vortex, in which, consequently, motion takes place along spirals. After deducing the equations of motion in cylindrical coordinates, a general solution is given, through which a differential equation for the current function is arrived at.—Prof. Moll presented, on behalf of Mr. J. H. Bonnerra, of Leeuwarden, a paper entitled "Sedimentary Erratics of Kloosterholt" (Heiligerlee). The erratics treated of in this paper have been gathered from boulder-clay. While the sedimentary erratics from Groningen bear a great resemblance to certain strata in the Russian Baltic provinces, those of Kloosterholt are more like certain Swedish rocks. As regards their geological age, most of them must be classed with the Silurian and the Chalk formation, while Cambrian Jurassic and Tertiary formations are more sparingly represented.